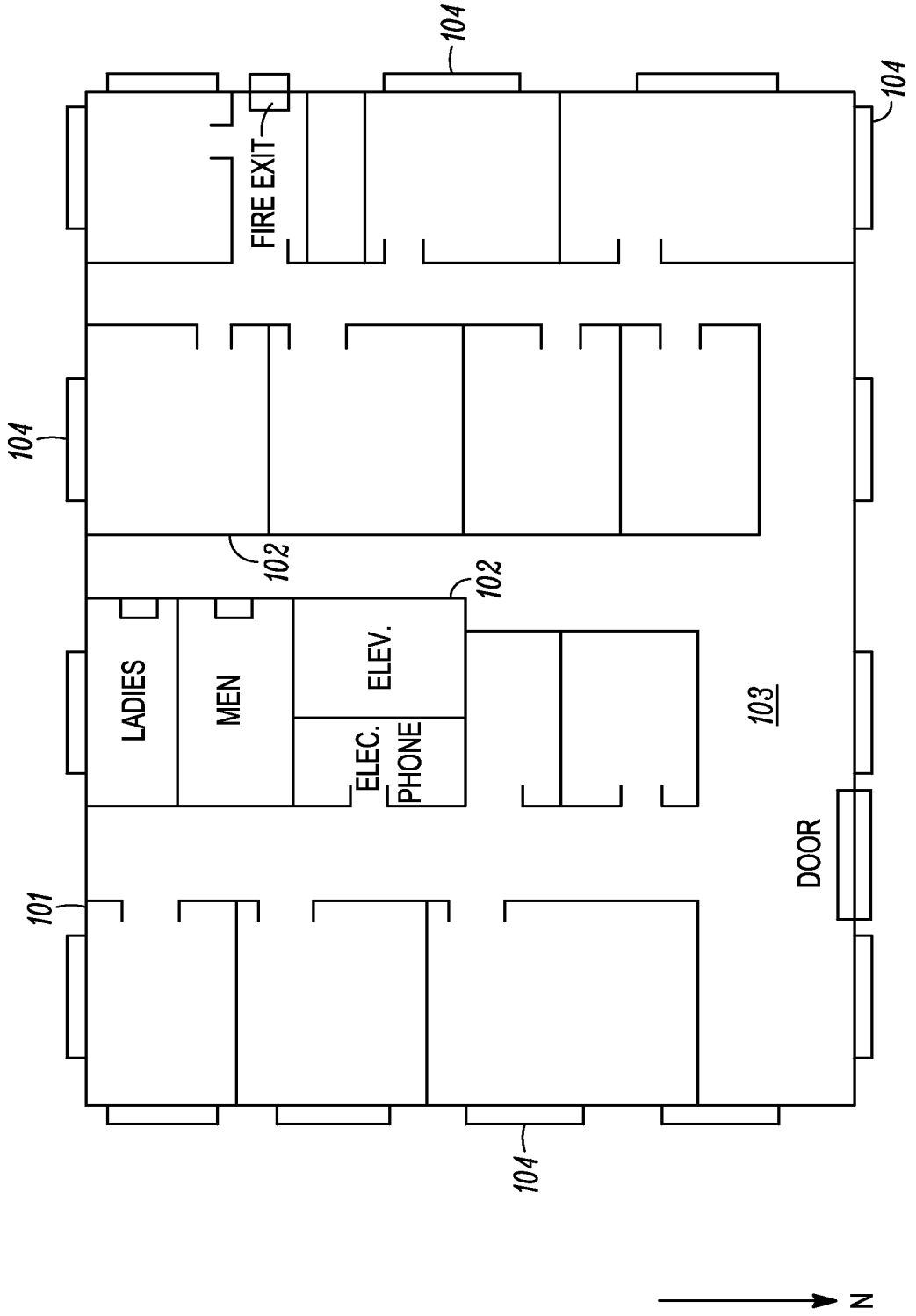
104
104
FIRE EXIT
104
102
102
LADIES
MEN
ELEV.
ELEC.
PHONE
103
DOOR
101
104
N

FIG. 1

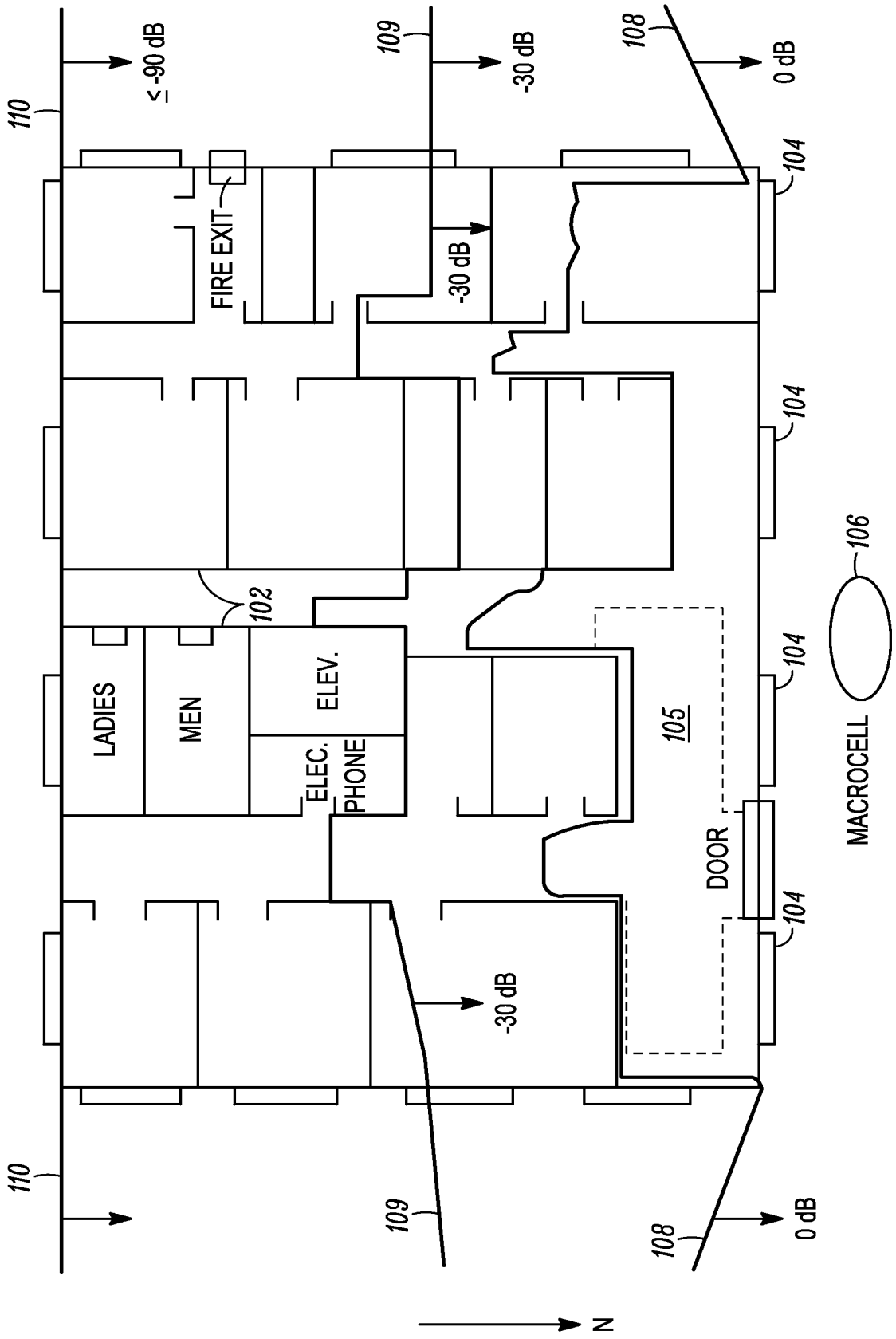
≤ -90 dB
-30 dB
0 dB
110
109
108
104
FIRE EXIT
-30 dB
102
LADIES
MEN
ELEV.
ELEC. PHONE
105
DOOR
MACROCELL
106
N

FIG. 2

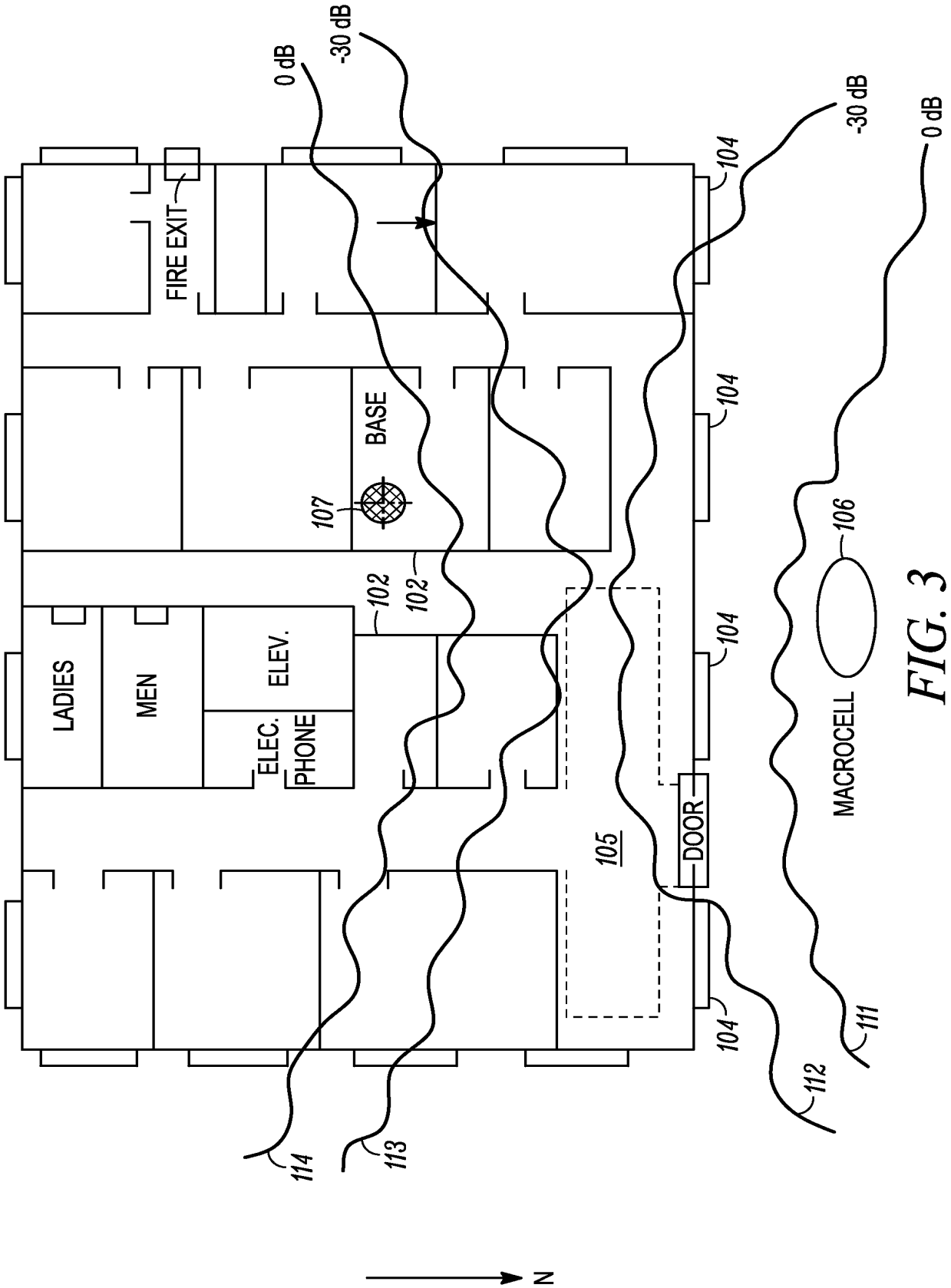
0 dB
-30 dB
-30 dB
0 dB
FIRE EXIT
BASE
107
104
104
104
104
102
102
106
LADIES
MEN
ELEV.
ELEC.
PHONE
105
DOOR
MACROCELL
111
112
114
113
N

FIG. 3

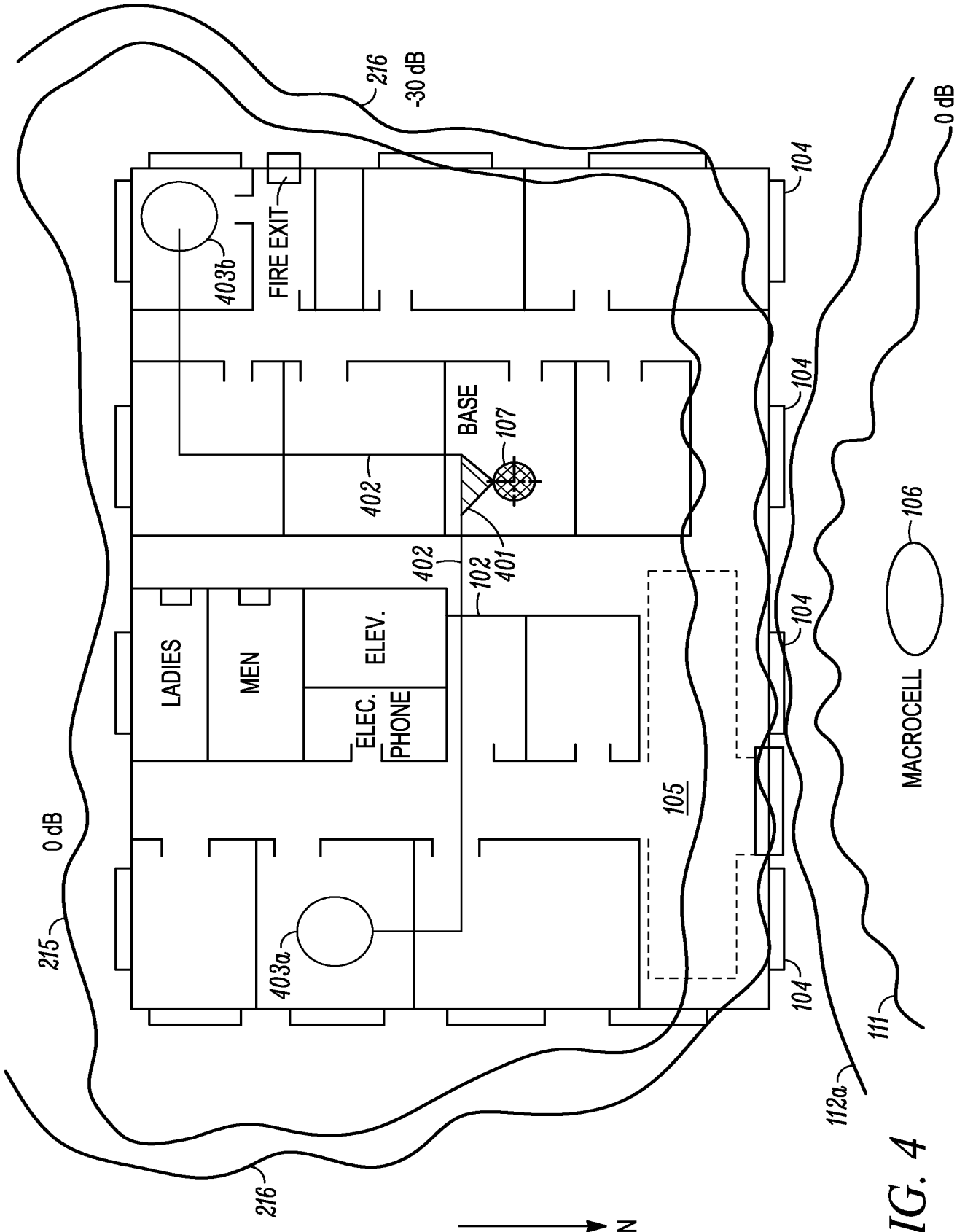
216
-30 dB
0 dB
104
403b
FIRE EXIT
BASE
107
402
401
102
LADIES
MEN
ELEV.
ELEC.
PHONE
105
106
MACROCELL
0 dB
215
403a
111
112a
216
N

FIG. 4

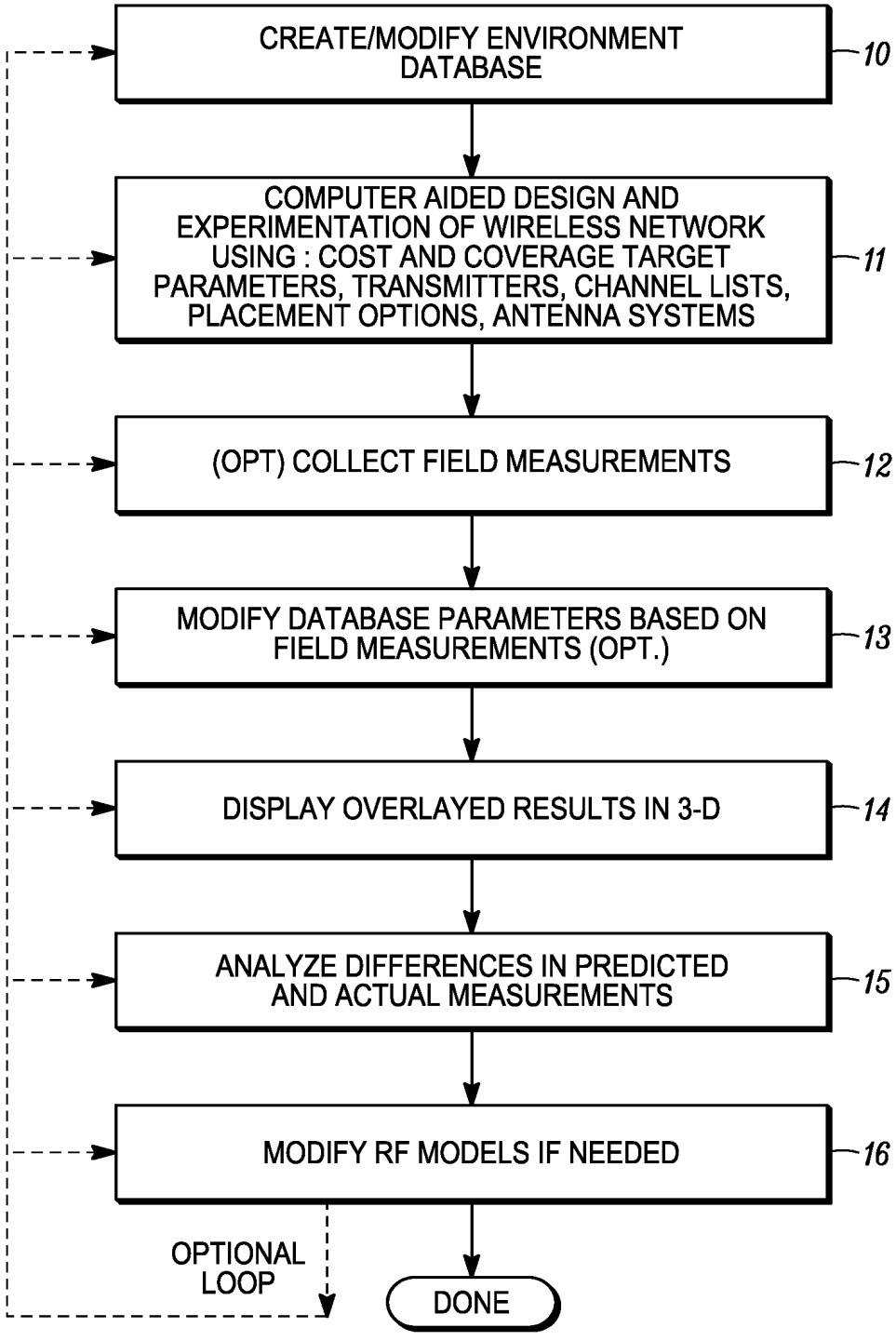
CREATE/MODIFY ENVIRONMENT DATABASE
10
COMPUTER AIDED DESIGN AND EXPERIMENTATION OF WIRELESS NETWORK USING : COST AND COVERAGE TARGET PARAMETERS, TRANSMITTERS, CHANNEL LISTS, PLACEMENT OPTIONS, ANTENNA SYSTEMS
11
(OPT) COLLECT FIELD MEASUREMENTS
12
MODIFY DATABASE PARAMETERS BASED ON FIELD MEASUREMENTS (OPT.)
13
DISPLAY OVERLAYED RESULTS IN 3-D
14
ANALYZE DIFFERENCES IN PREDICTED AND ACTUAL MEASUREMENTS
15
MODIFY RF MODELS IF NEEDED
16
OPTIONAL LOOP
DONE

FIG. 5

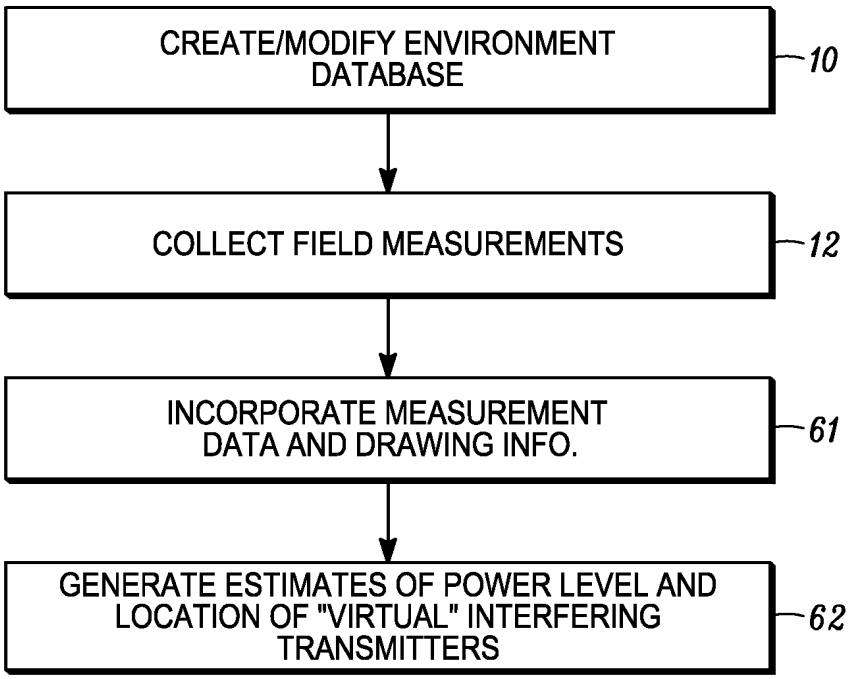
CREATE/MODIFY ENVIRONMENT DATABASE
10
COLLECT FIELD MEASUREMENTS
12
INCORPORATE MEASUREMENT DATA AND DRAWING INFO.
61
GENERATE ESTIMATES OF POWER LEVEL AND LOCATION OF "VIRTUAL" INTERFERING TRANSMITTERS
62

FIG. 6

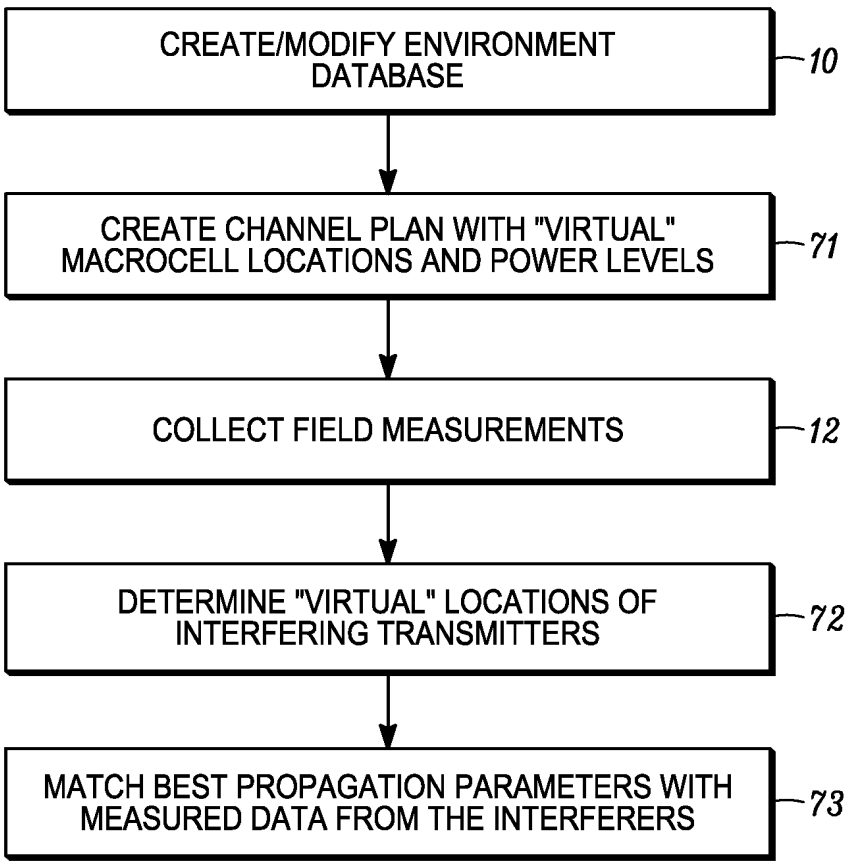
CREATE/MODIFY ENVIRONMENT DATABASE
10
CREATE CHANNEL PLAN WITH "VIRTUAL" MACROCELL LOCATIONS AND POWER LEVELS
71
COLLECT FIELD MEASUREMENTS
12
DETERMINE "VIRTUAL" LOCATIONS OF INTERFERING TRANSMITTERS
72
MATCH BEST PROPAGATION PARAMETERS WITH MEASURED DATA FROM THE INTERFERERS
73

FIG. 7

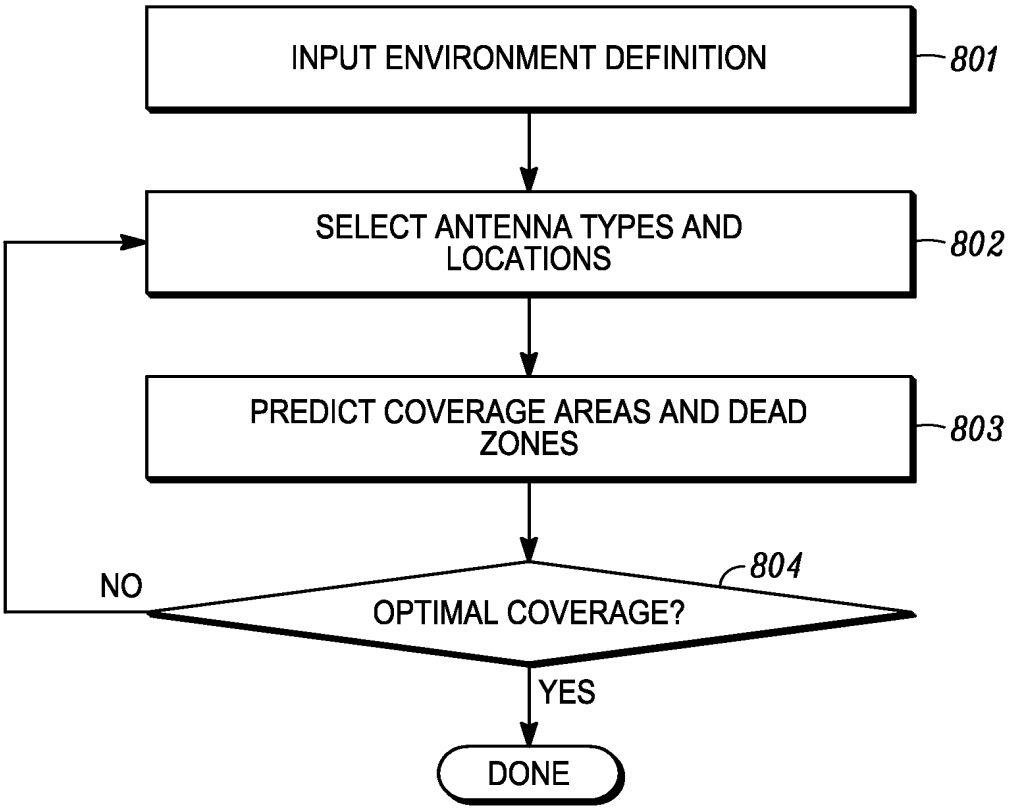
INPUT ENVIRONMENT DEFINITION
801
SELECT ANTENNA TYPES AND LOCATIONS
802
PREDICT COVERAGE AREAS AND DEAD ZONES
803
804
OPTIMAL COVERAGE?
NO
YES
DONE

FIG. 8

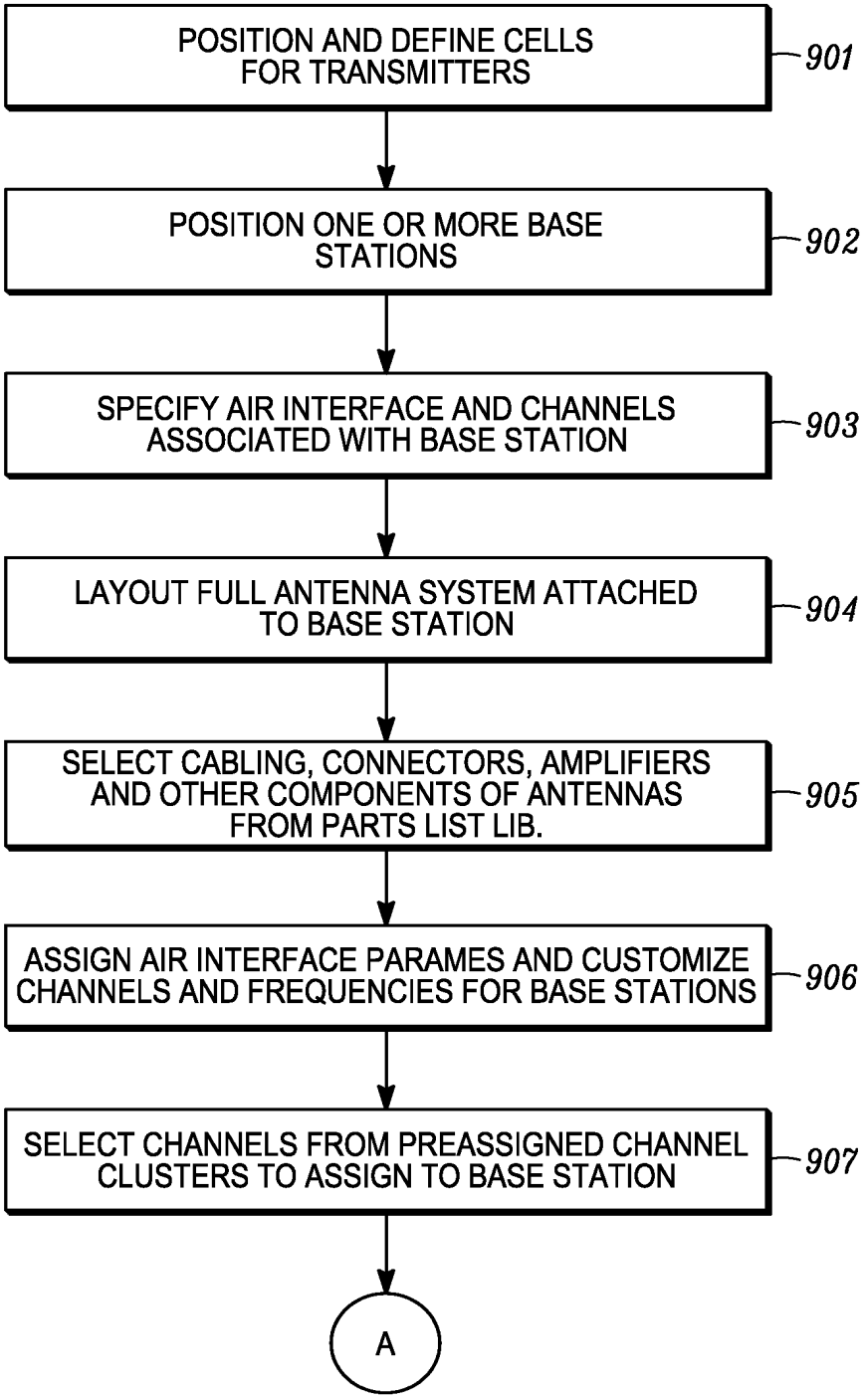
POSITION AND DEFINE CELLS FOR TRANSMITTERS
901
POSITION ONE OR MORE BASE STATIONS
902
SPECIFY AIR INTERFACE AND CHANNELS ASSOCIATED WITH BASE STATION
903
LAYOUT FULL ANTENNA SYSTEM ATTACHED TO BASE STATION
904
SELECT CABLING, CONNECTORS, AMPLIFIERS AND OTHER COMPONENTS OF ANTENNAS FROM PARTS LIST LIB.
905
ASSIGN AIR INTERFACE PARAMES AND CUSTOMIZE CHANNELS AND FREQUENCIES FOR BASE STATIONS
906
SELECT CHANNELS FROM PREASSIGNED CHANNEL CLUSTERS TO ASSIGN TO BASE STATION
907
A

FIG. 9A

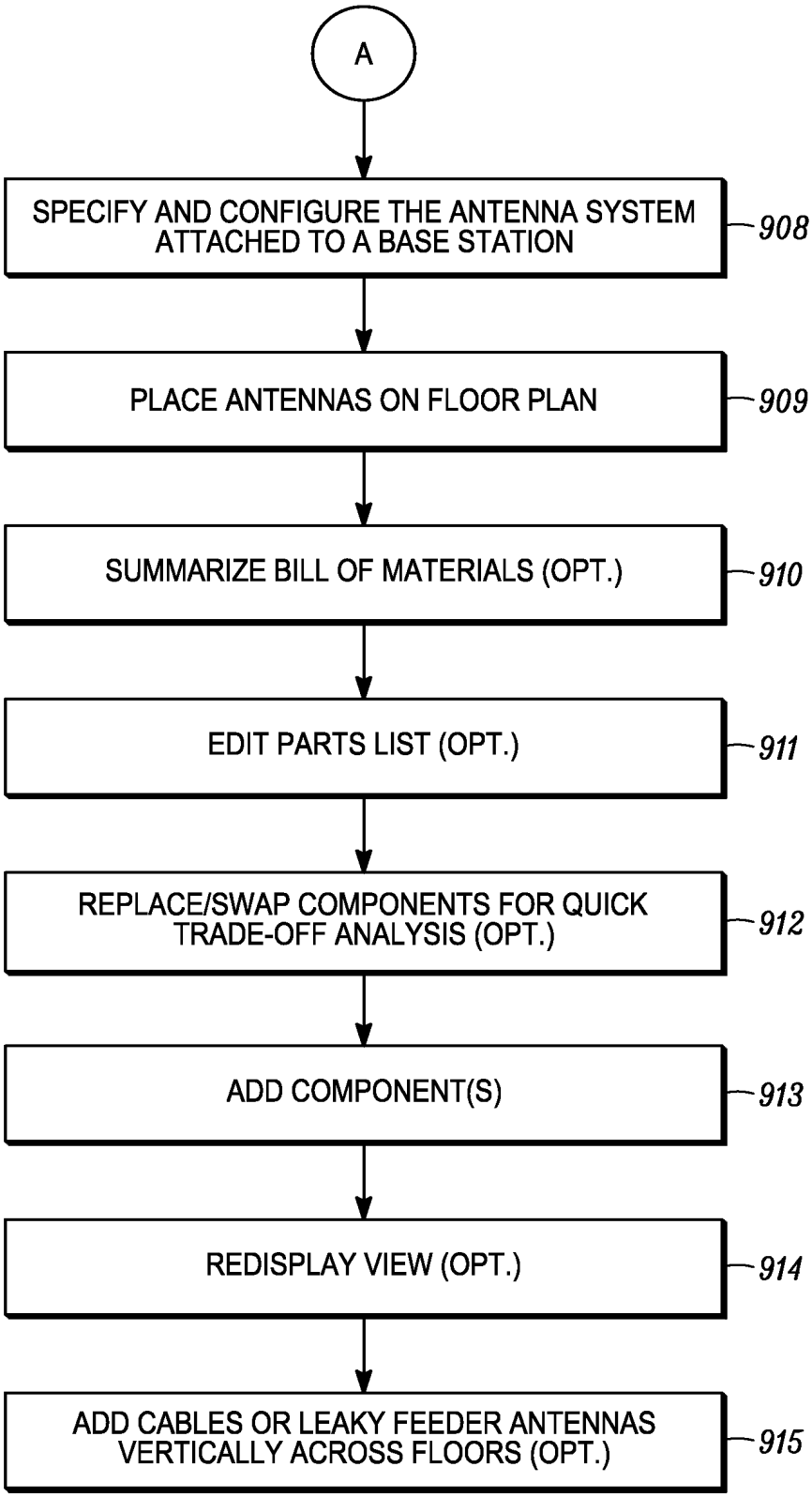
A
SPECIFY AND CONFIGURE THE ANTENNA SYSTEM ATTACHED TO A BASE STATION
908
PLACE ANTENNAS ON FLOOR PLAN
909
SUMMARIZE BILL OF MATERIALS (OPT.)
910
EDIT PARTS LIST (OPT.)
911
REPLACE/SWAP COMPONENTS FOR QUICK TRADE-OFF ANALYSIS (OPT.)
912
ADD COMPONENT(S)
913
REDISPLAY VIEW (OPT.)
914
ADD CABLES OR LEAKY FEEDER ANTENNAS VERTICALLY ACROSS FLOORS (OPT.)
915

FIG. 9B

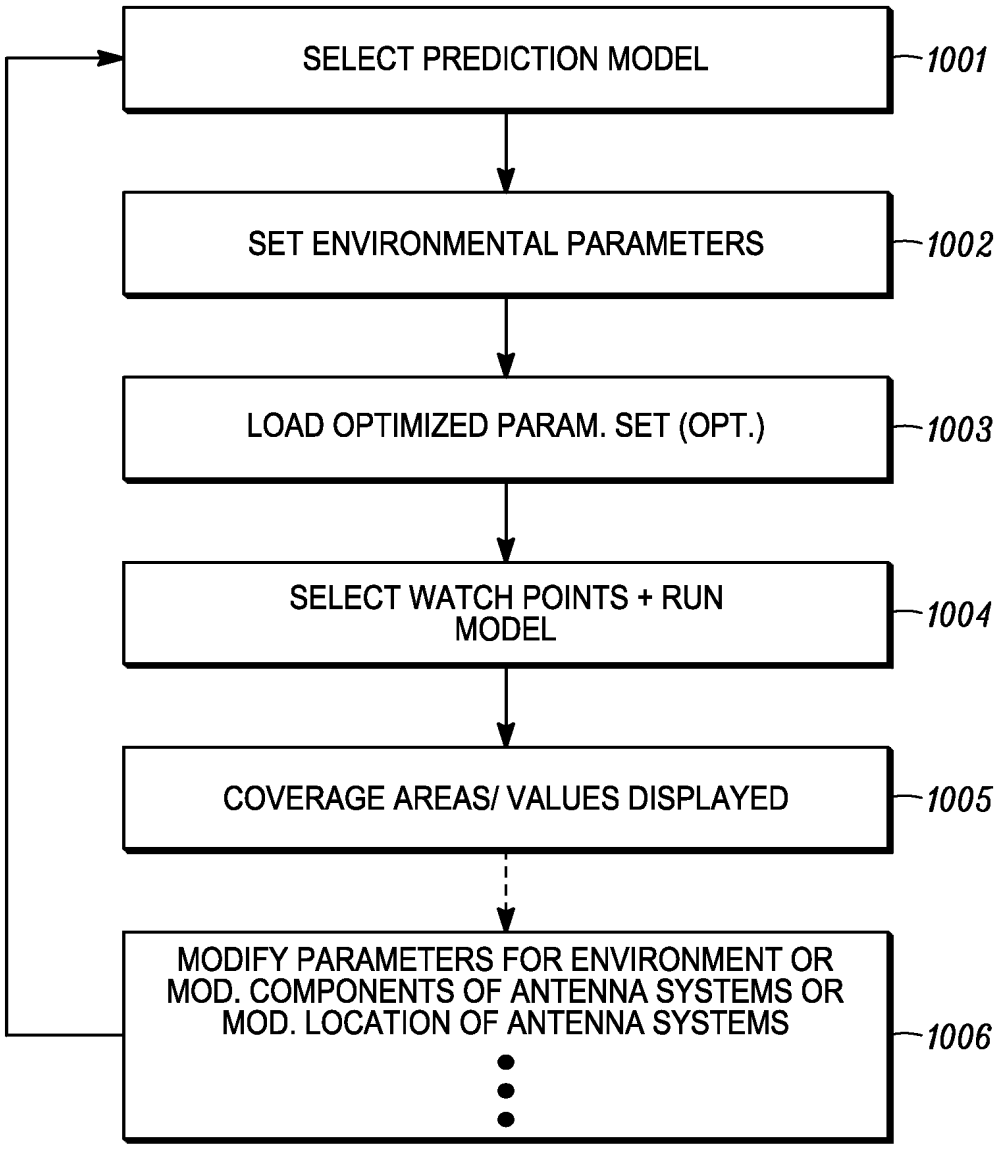
SELECT PREDICTION MODEL
1001
SET ENVIRONMENTAL PARAMETERS
1002
LOAD OPTIMIZED PARAM. SET (OPT.)
1003
SELECT WATCH POINTS + RUN MODEL
1004
COVERAGE AREAS/ VALUES DISPLAYED
1005
MODIFY PARAMETERS FOR ENVIRONMENT OR MOD. COMPONENTS OF ANTENNA SYSTEMS OR MOD. LOCATION OF ANTENNA SYSTEMS
1006

FIG. 10

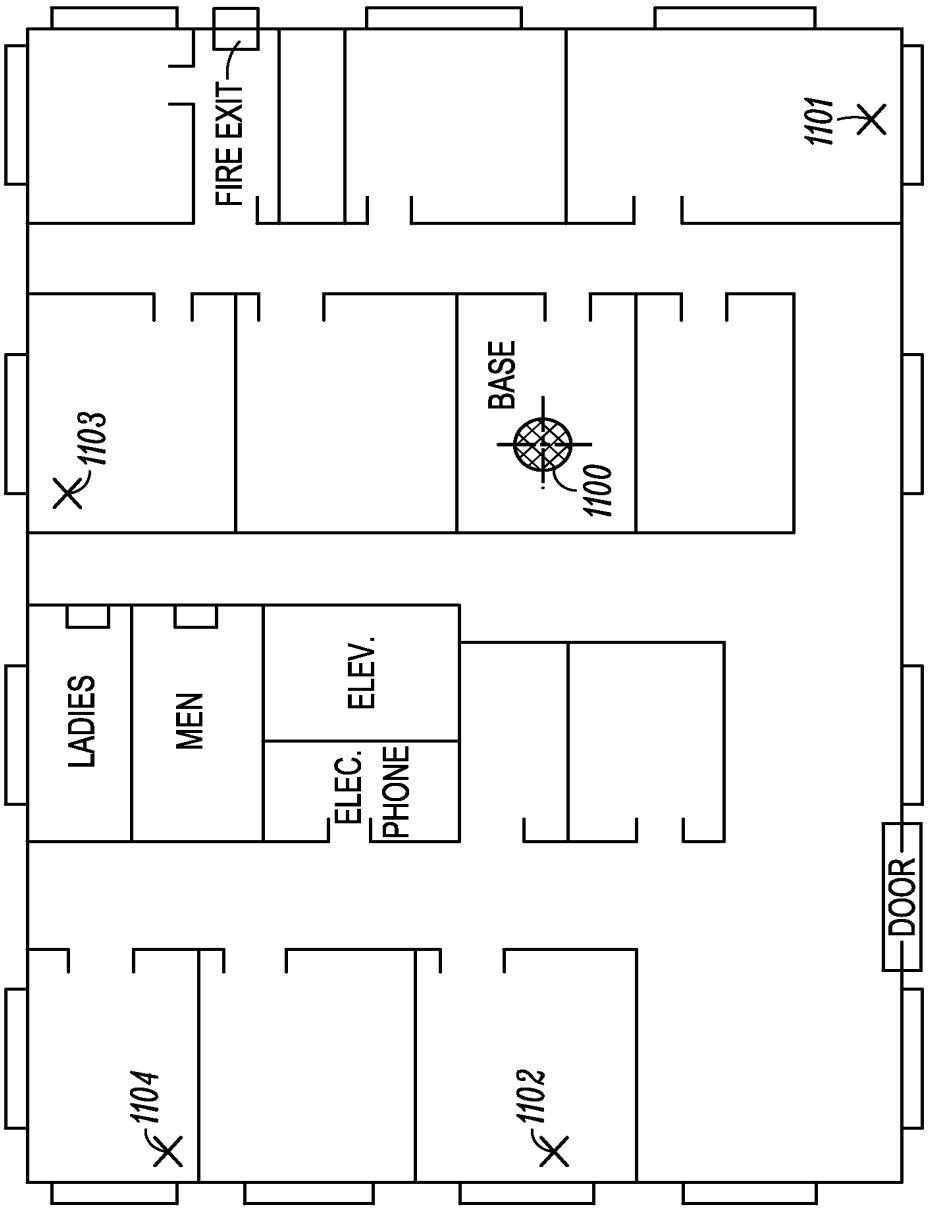
FIRE EXIT
1101
1103
BASE
1100
LADIES
MEN
ELEV.
ELEC.
PHONE
DOOR
1104
1102

FIG. 11

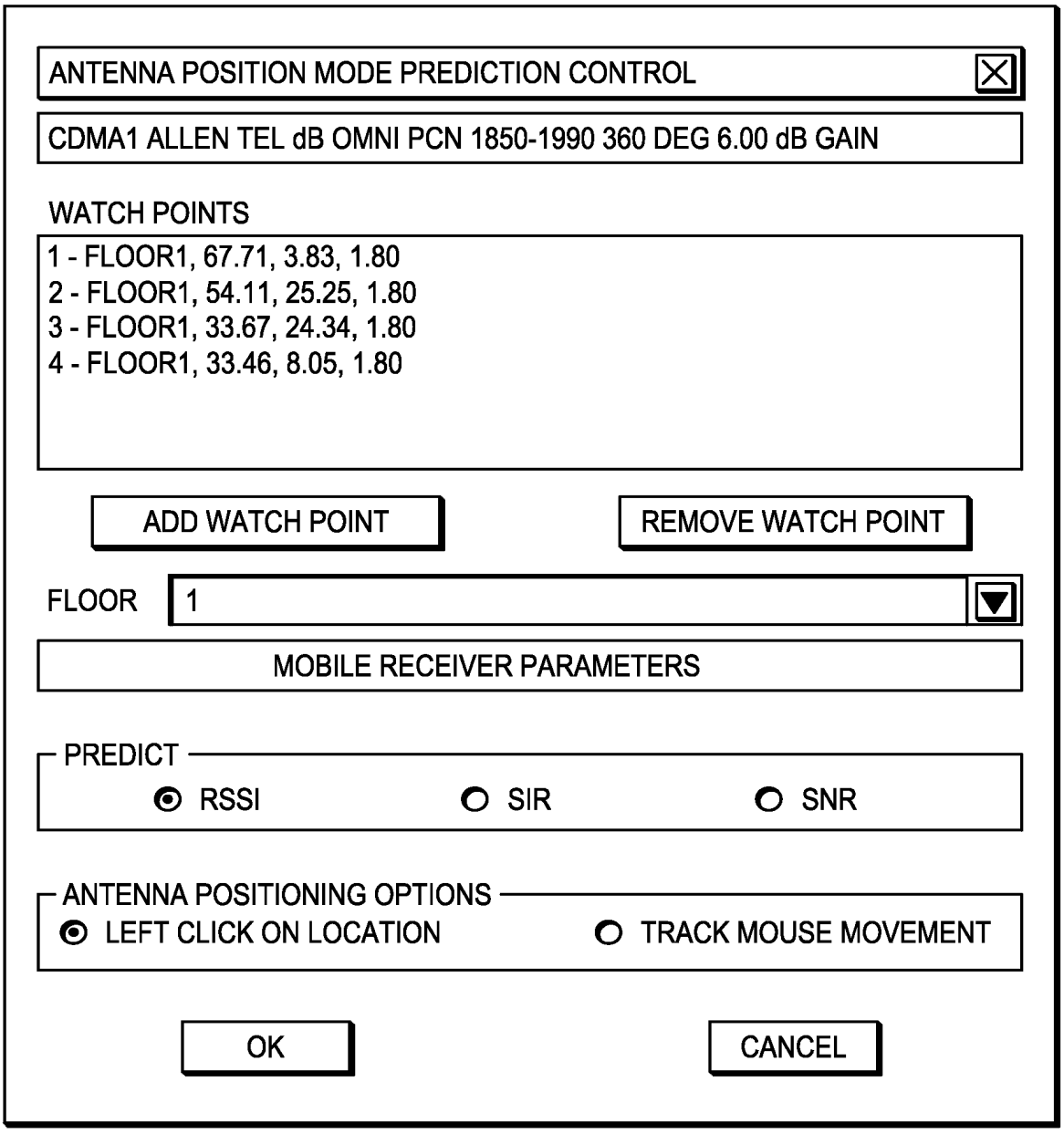
ANTENNA POSITION MODE PREDICTION CONTROL
CDMA1 ALLEN TEL dB OMNI PCN 1850-1990 360 DEG 6.00 dB GAIN
WATCH POINTS
1 - FLOOR1, 67.71, 3.83, 1.80
2 - FLOOR1, 54.11, 25.25, 1.80
3 - FLOOR1, 33.67, 24.34, 1.80
4 - FLOOR1, 33.46, 8.05, 1.80
ADD WATCH POINT
REMOVE WATCH POINT
FLOOR
1
MOBILE RECEIVER PARAMETERS
PREDICT
RSSI
SIR
SNR
ANTENNA POSITIONING OPTIONS
LEFT CLICK ON LOCATION
TRACK MOUSE MOVEMENT
OK
CANCEL

FIG. 12

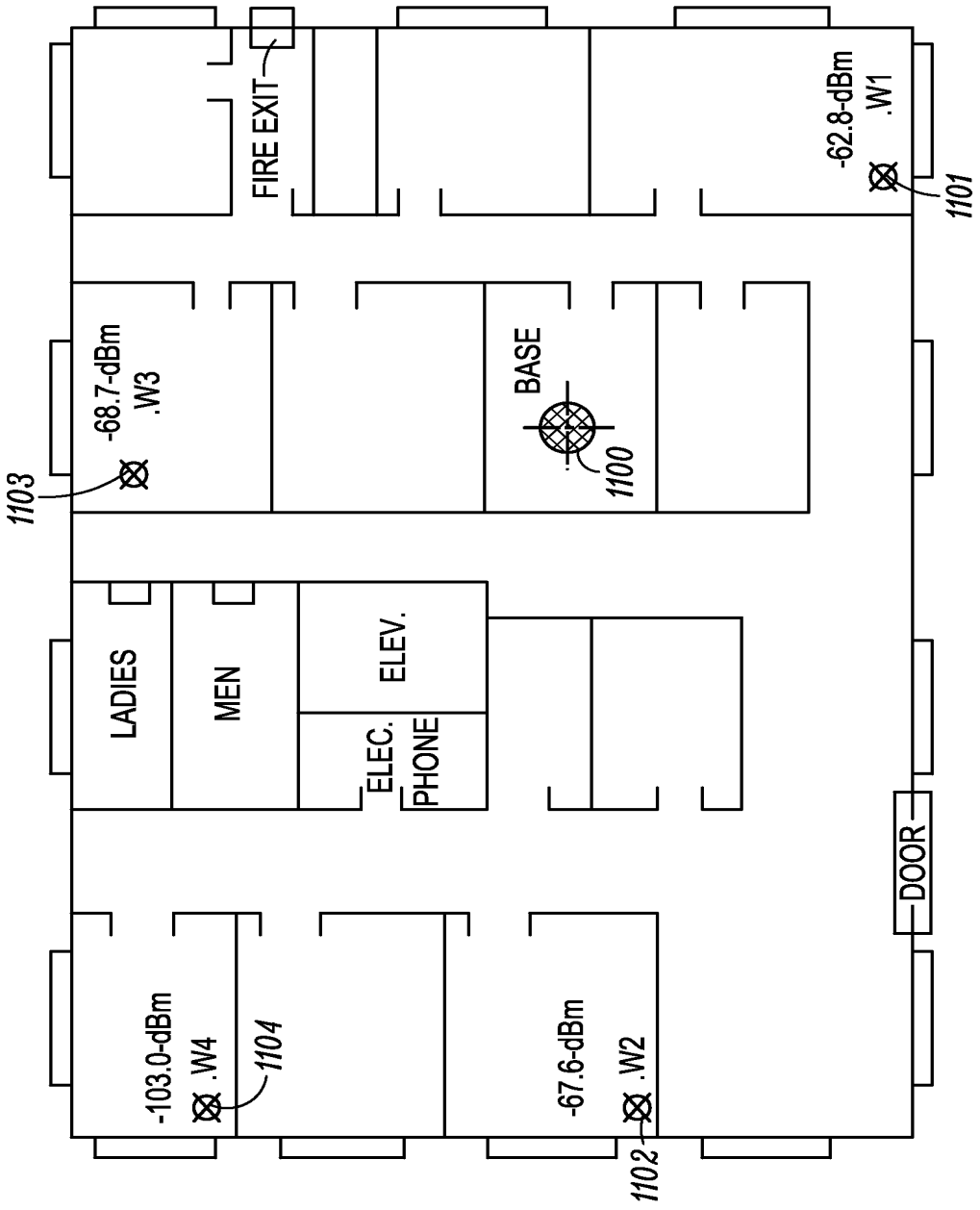
FIRE EXIT
-62.8-dBm
.W1
1101
-68.7-dBm
.W3
1103
BASE
1100
LADIES
MEN
ELEV.
ELEC.
PHONE
DOOR
-103.0-dBm
.W4
1104
-67.6-dBm
.W2
1102

FIG. 13

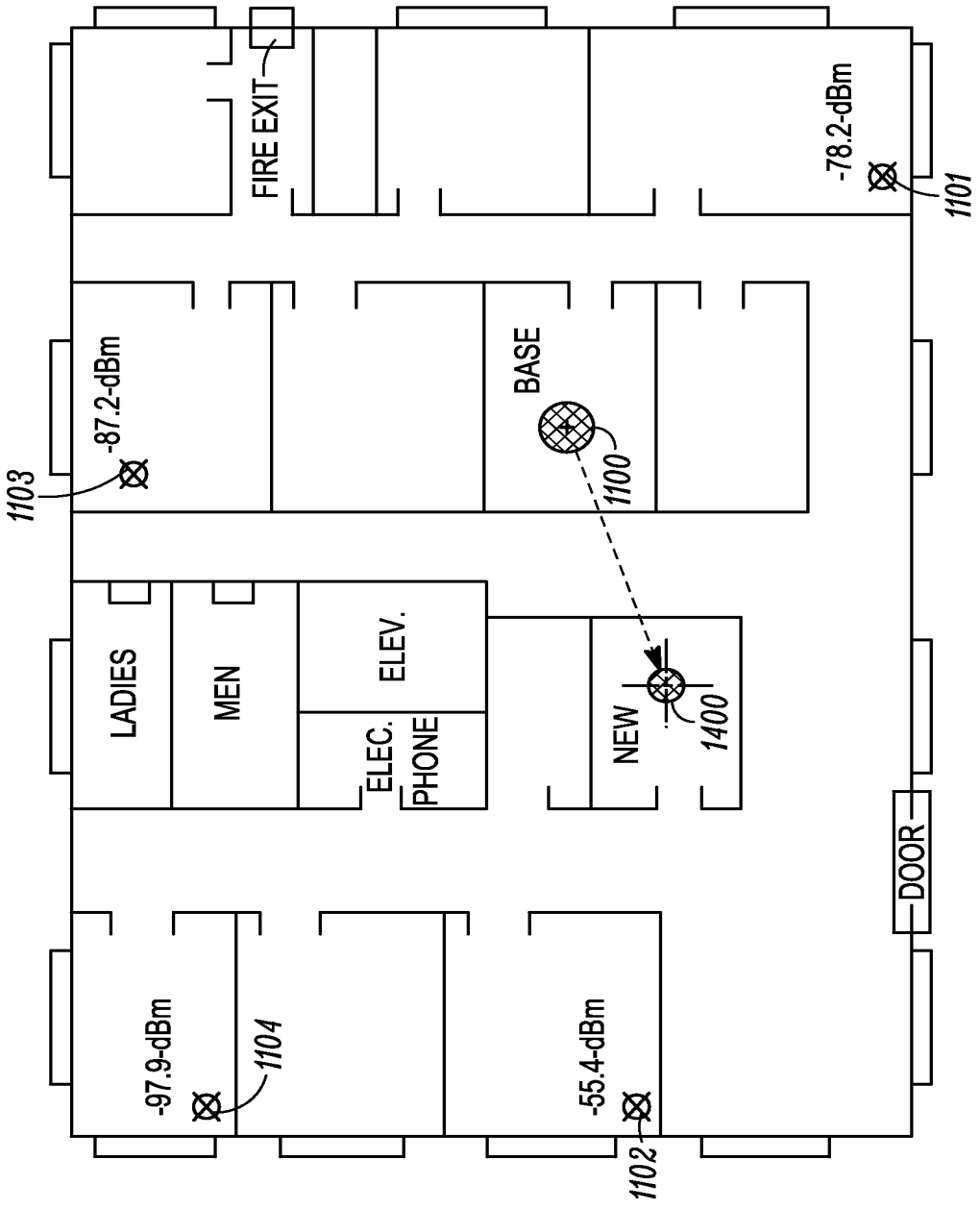
FIRE EXIT
-78.2-dBm
1101
-87.2-dBm
1103
BASE
1100
LADIES
MEN
ELEV.
ELEC.
PHONE
NEW
1400
DOOR
-97.9-dBm
1104
-55.4-dBm
1102

FIG. 14

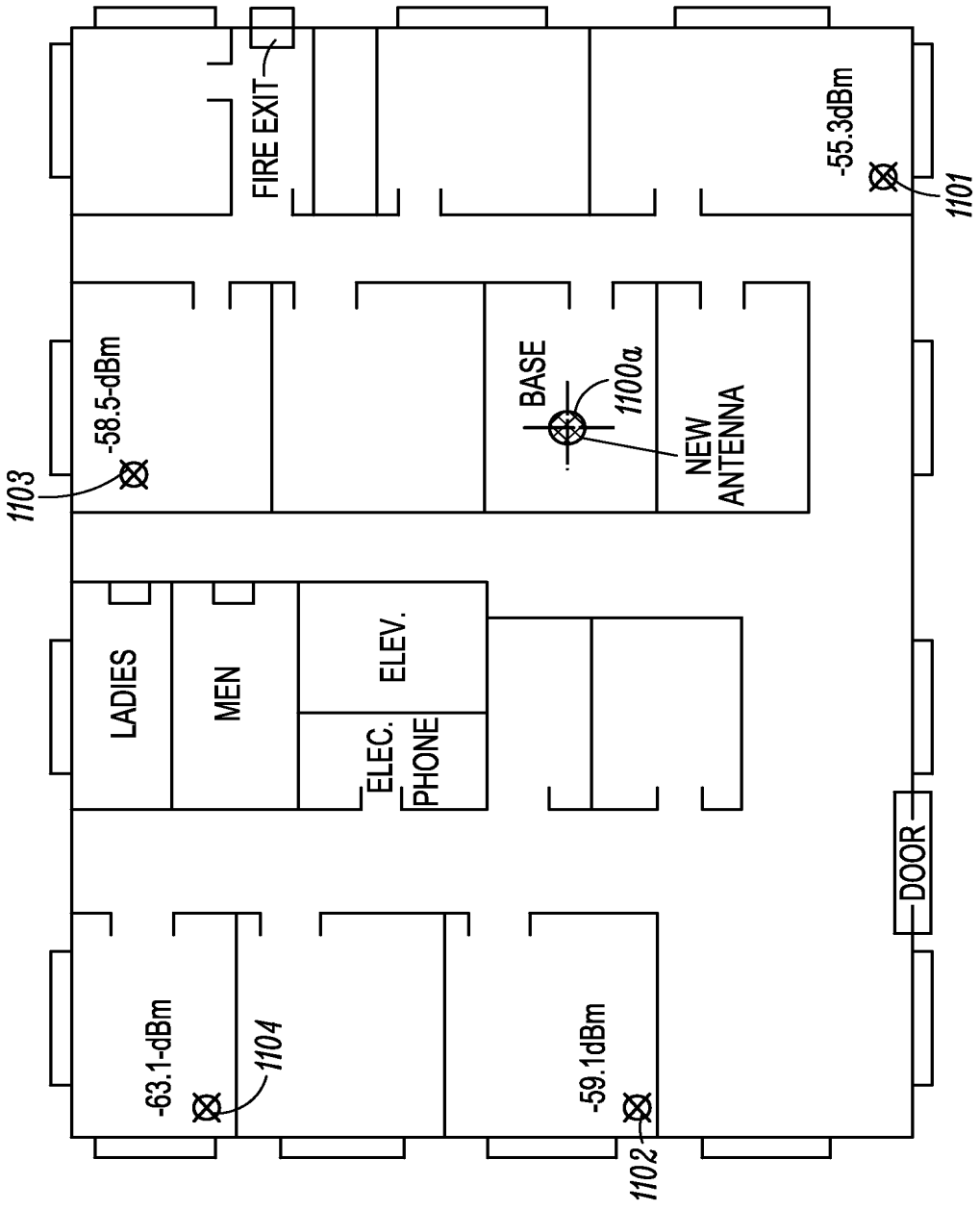
FIRE EXIT
-55.3dBm
1101
-58.5-dBm
1103
BASE
1100a
NEW
ANTENNA
LADIES
MEN
ELEV.
ELEC.
PHONE
DOOR
-63.1-dBm
1104
-59.1dBm
1102

FIG. 15

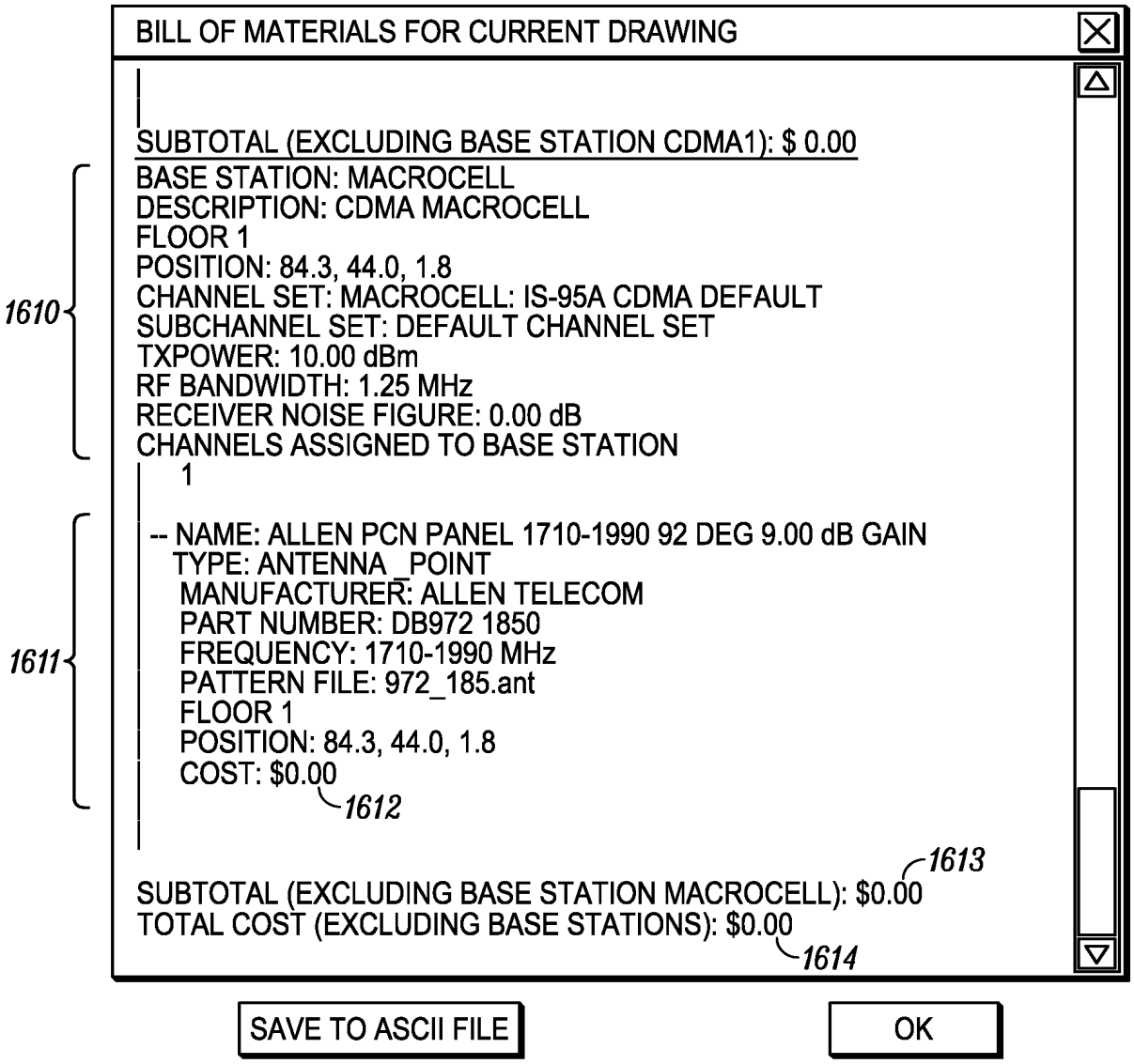
BILL OF MATERIALS FOR CURRENT DRAWING
SUBTOTAL (EXCLUDING BASE STATION CDMA1): $ 0.00
BASE STATION: MACROCELL
DESCRIPTION: CDMA MACROCELL
FLOOR 1
POSITION: 84.3, 44.0, 1.8
CHANNEL SET: MACROCELL: IS-95A CDMA DEFAULT
SUBCHANNEL SET: DEFAULT CHANNEL SET
TXPOWER: 10.00 dBm
RF BANDWIDTH: 1.25 MHz
RECEIVER NOISE FIGURE: 0.00 dB
CHANNELS ASSIGNED TO BASE STATION
1
1610
-- NAME: ALLEN PCN PANEL 1710-1990 92 DEG 9.00 dB GAIN
TYPE: ANTENNA _POINT
MANUFACTURER: ALLEN TELECOM
PART NUMBER: DB972 1850
FREQUENCY: 1710-1990 MHz
PATTERN FILE: 972_185.ant
FLOOR 1
POSITION: 84.3, 44.0, 1.8
COST: $0.00
1611
1612
1613
SUBTOTAL (EXCLUDING BASE STATION MACROCELL): $0.00
TOTAL COST (EXCLUDING BASE STATIONS): $0.00
1614
SAVE TO ASCII FILE
OK

FIG. 16

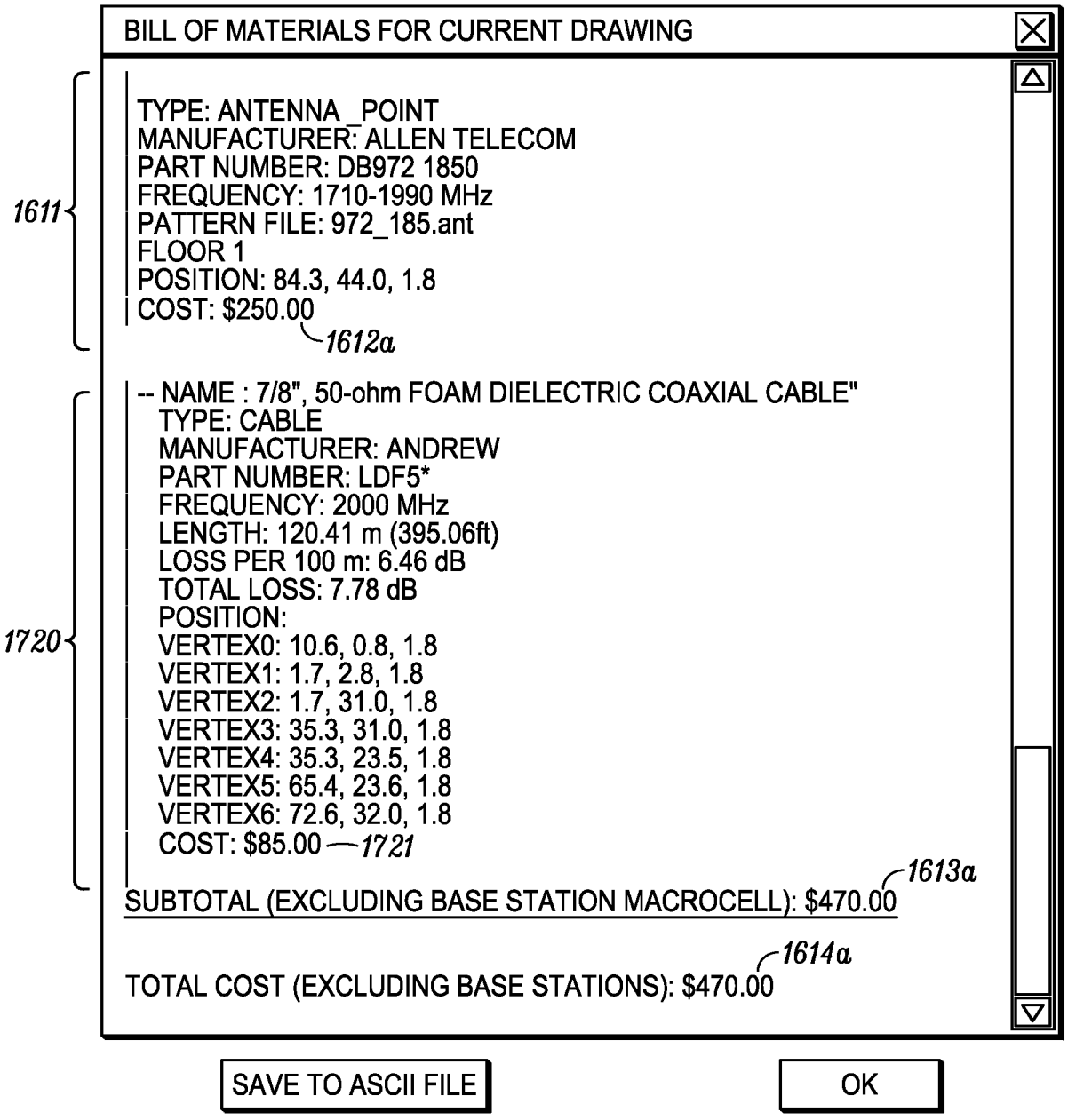
BILL OF MATERIALS FOR CURRENT DRAWING
1611
TYPE: ANTENNA _POINT
MANUFACTURER: ALLEN TELECOM
PART NUMBER: DB972 1850
FREQUENCY: 1710-1990 MHz
PATTERN FILE: 972_185.ant
FLOOR 1
POSITION: 84.3, 44.0, 1.8
COST: $250.00
1612a
1720
-- NAME : 7/8", 50-ohm FOAM DIELECTRIC COAXIAL CABLE"
TYPE: CABLE
MANUFACTURER: ANDREW
PART NUMBER: LDF5*
FREQUENCY: 2000 MHz
LENGTH: 120.41 m (395.06ft)
LOSS PER 100 m: 6.46 dB
TOTAL LOSS: 7.78 dB
POSITION:
VERTEX0: 10.6, 0.8, 1.8
VERTEX1: 1.7, 2.8, 1.8
VERTEX2: 1.7, 31.0, 1.8
VERTEX3: 35.3, 31.0, 1.8
VERTEX4: 35.3, 23.5, 1.8
VERTEX5: 65.4, 23.6, 1.8
VERTEX6: 72.6, 32.0, 1.8
COST: $85.00
1721
1613a
SUBTOTAL (EXCLUDING BASE STATION MACROCELL): $470.00
1614a
TOTAL COST (EXCLUDING BASE STATIONS): $470.00
SAVE TO ASCII FILE
OK

FIG. 17

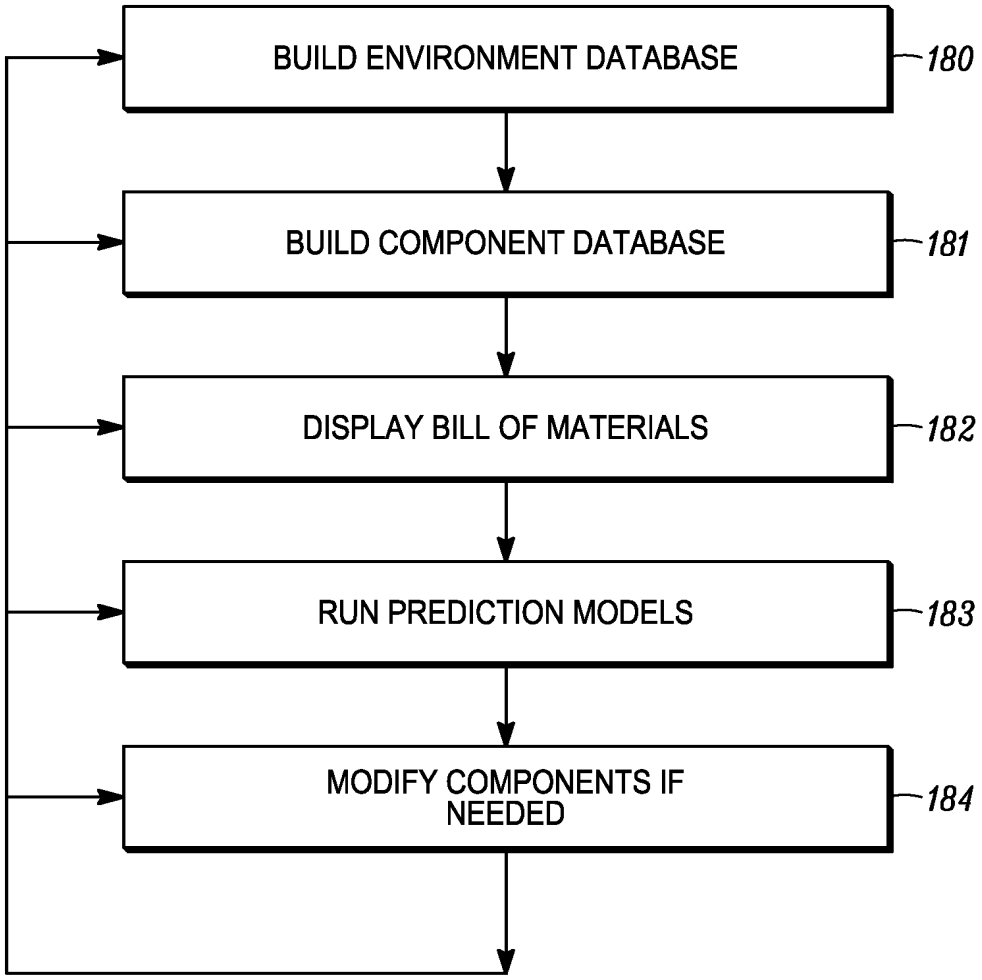
BUILD ENVIRONMENT DATABASE
180
BUILD COMPONENT DATABASE
181
DISPLAY BILL OF MATERIALS
182
RUN PREDICTION MODELS
183
MODIFY COMPONENTS IF NEEDED
184

FIG. 18

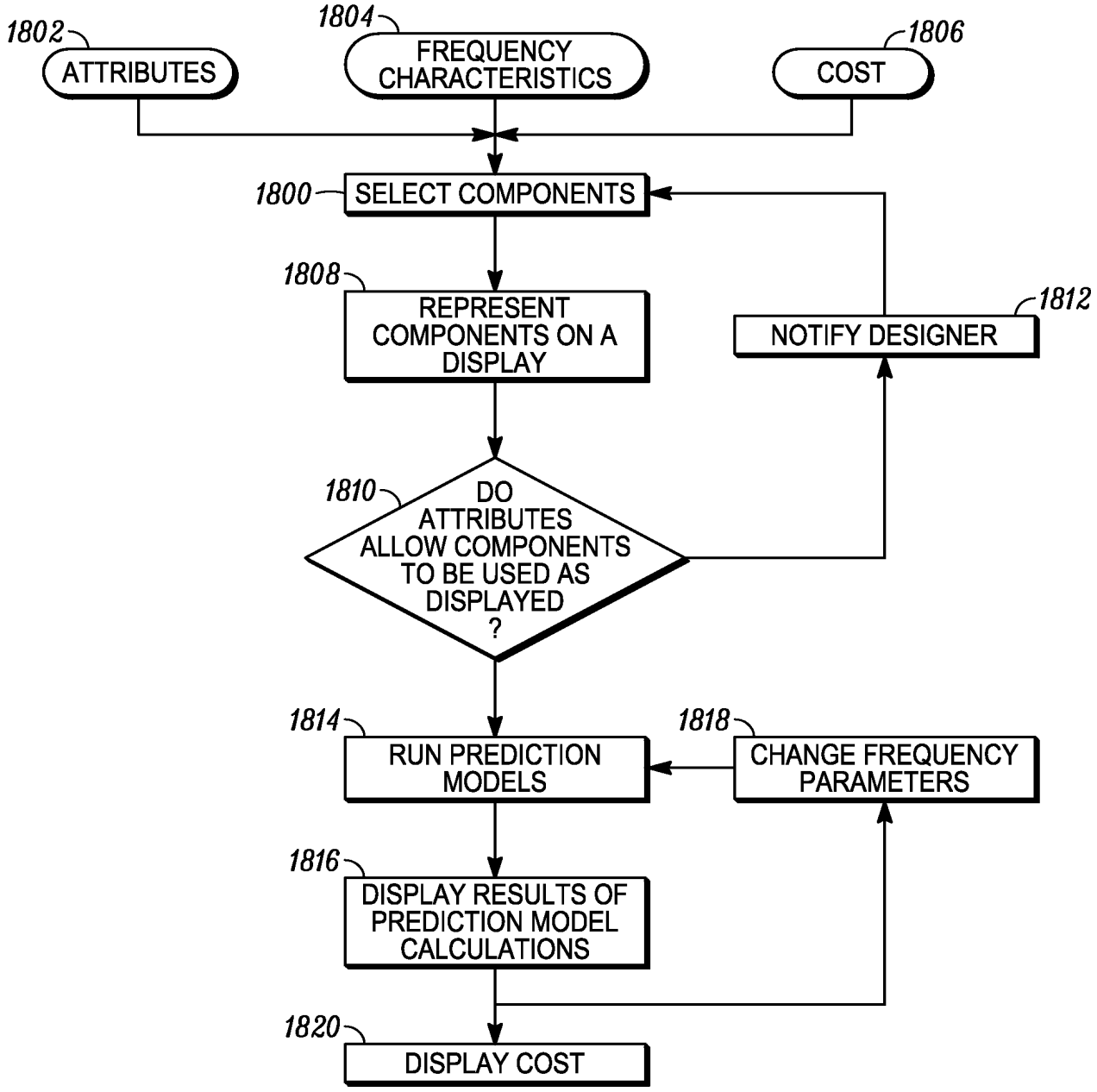
1802
ATTRIBUTES
1804
FREQUENCY CHARACTERISTICS
1806
COST
1800
SELECT COMPONENTS
1808
REPRESENT COMPONENTS ON A DISPLAY
1812
NOTIFY DESIGNER
1810
DO ATTRIBUTES ALLOW COMPONENTS TO BE USED AS DISPLAYED ?
1814
RUN PREDICTION MODELS
1818
CHANGE FREQUENCY PARAMETERS
1816
DISPLAY RESULTS OF PREDICTION MODEL CALCULATIONS
1820
DISPLAY COST

FIG. 19

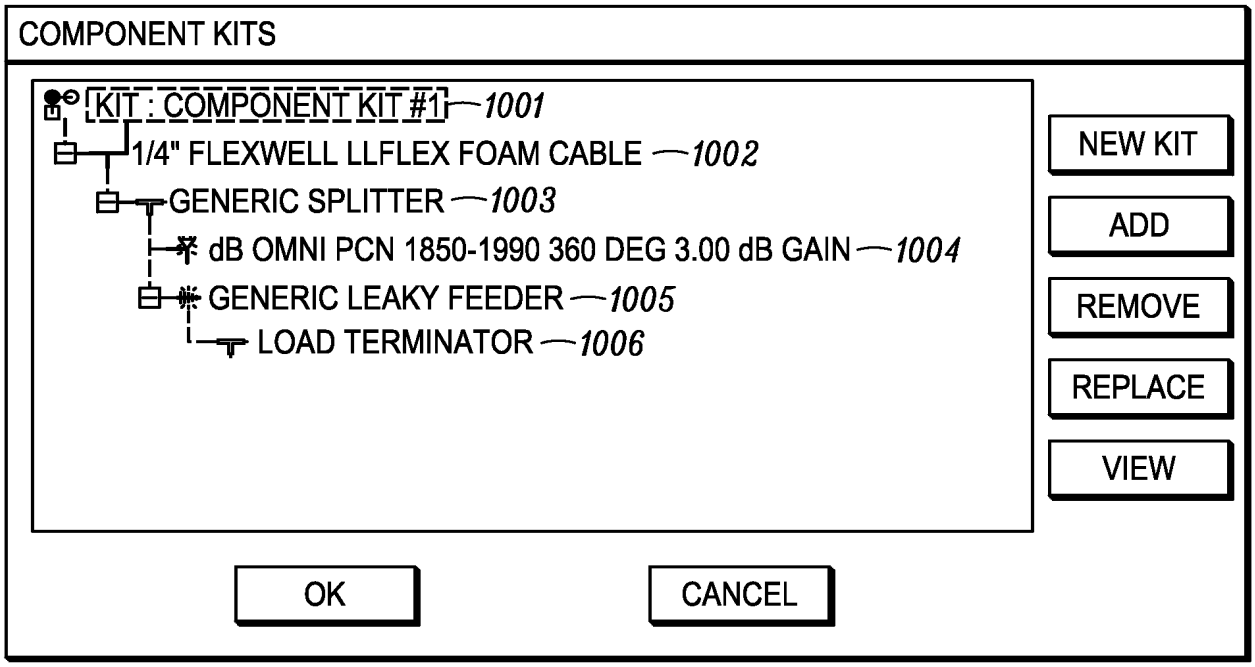
COMPONENT KITS
KIT : COMPONENT KIT #1
1001
1/4" FLEXWELL LLFLEX FOAM CABLE
1002
GENERIC SPLITTER
1003
dB OMNI PCN 1850-1990 360 DEG 3.00 dB GAIN
1004
GENERIC LEAKY FEEDER
1005
LOAD TERMINATOR
1006
NEW KIT
ADD
REMOVE
REPLACE
VIEW
OK
CANCEL

FIG. 20

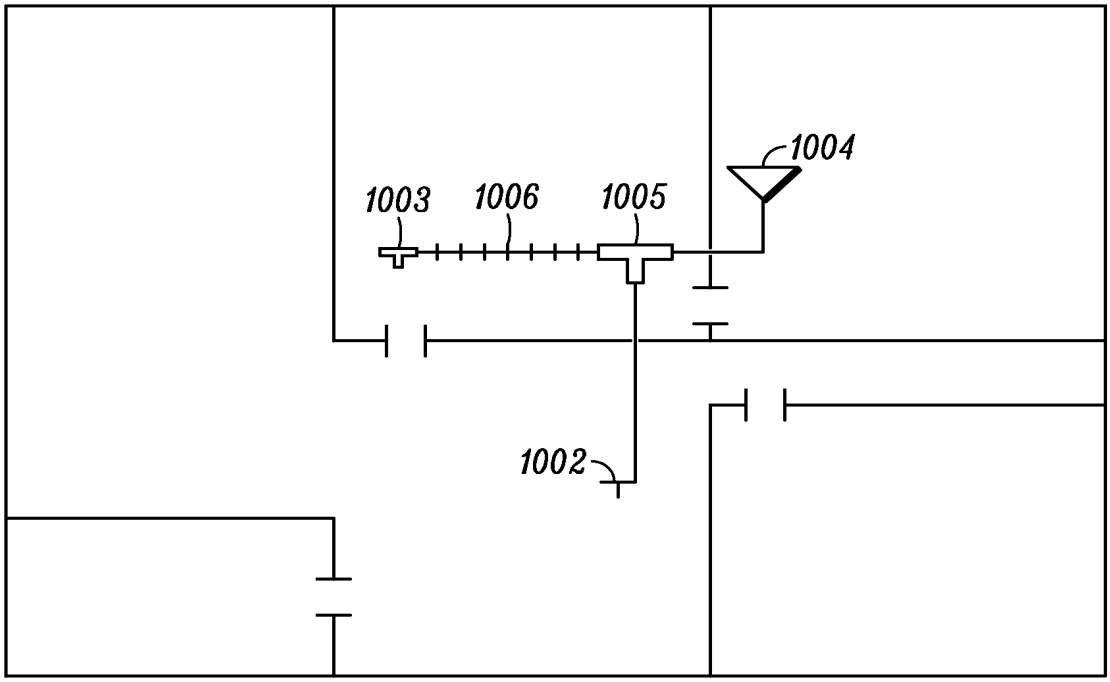
1004
1003
1006
1005
1002

FIG. 21